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OPERATING EXPERIENCE WEEKLY SUMMARY

Office of Nuclear and Facility Safety

March 26- April 1, 1999

Summary 99-13

Operating Experience Weekly Summary 99-13

March 26 - April 1, 1999

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EVENTS

1. FALLING STRONGBACK RESULTS IN NEAR MISS

On March 22, 1999, at the Idaho National Engineering Environmental Laboratory Advanced Test Reactor, a strongback dislodged from a docking plate and fell approximately 6 ft into a storage well. Riggers had accidentally snagged and lifted it while moving an irradiation test vehicle inpile tube assembly with a 10-ton bridge crane. The strongback is a specially designed pipe that weighs approximately 1,500 lb and is used as a support structure for the inpile tube assembly when it is in a horizontal position and to upright the assembly into a vertical position. A crane spotter saw the strongback snag the inpile tube assembly, signaled the crane operator to stop, and saw the strongback begin to fall. He moved out of the way of the strongback and its attached lifting bails to avoid being struck as they fell uncontrolled into the storage well, contacted and structurally damaged the docking plate, and contacted and chipped concrete from the reactor main floor (see Figure 1-1). The crane spotter and a job supervisor were close to the storage well during this event and could have been seriously injured if they had been struck. (ORPS Report ID--LITC-ATR-1999-0008)

Workers had uprighted the inpile tube assembly and strongback, stored them in a temporary storage well, disconnected the inpile tube assembly from the strongback, and docked the strongback in a docking plate. The docking plate held the strongback in place by gravity and locating pins. The riggers were moving the inpile tube assembly from the temporary storage well into another storage well when it snagged the strongback and lifted it up enough to dislodge the strongback from its docked position (see Figure 1-2). Investigators determined that the 400-lb inpile tube assembly was new and was being prepared for initial installation in the Advanced Test Reactor. They conducted a preliminary inspection of the inpile tube assembly and did not identify any damage to it. However, because the inpile tube assembly supported the weight of the strongback during this event, investigators believe that it may have been overstressed. They will further inspect it to determine if it was damaged.

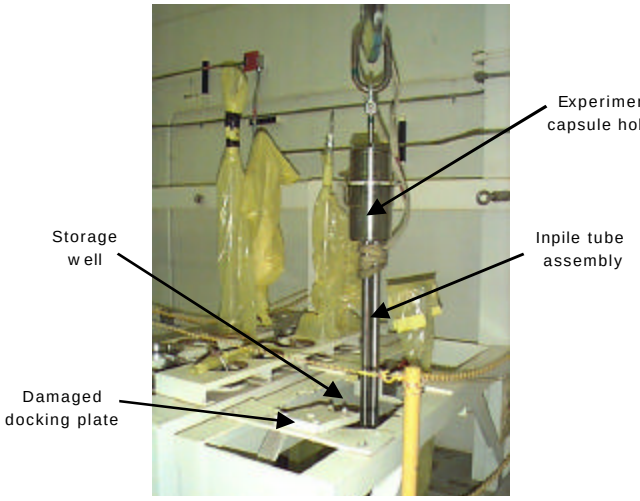

Figure 1-1. Inpile Tube and Damaged Docking Plate

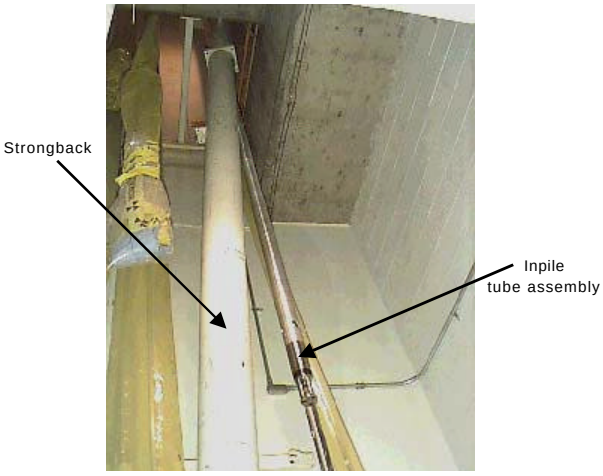

Figure 1-2. Strongback and Inpile Tube

Facility managers stopped all facility activities and held an emergency recovery meeting to determine how to proceed. They isolated the storage area fire water system and implemented compensatory measures because the top of the strongback is leaning against a 1½ inch fire

water pipe. Meeting attendees learned that the riggers were following detailed engineering work instructions for this activity and that the total weight lifted was approximately 1 ton. They learned that an upward movement of the strongback of only a ½ in. can cause it to disengage from its docked position. This short distance was traversed before the crane operator could react to the spotter's signal to stop the crane's movement. Attendees also learned that green plastic sleeving on the inpile tube assembly may have hindered the crane spotter's and the job supervisor's view of the bottom of the inpile tube assembly as it was being lifted. They learned that no one had considered that the strongback could become dislodged. Facility managers determined that the potential consequences of this event were mitigated because personnel had locked first- and second-basement access doors that would have permitted access to the area underneath the area where the strongback fell. In addition, all personnel not directly involved with the lifting evolution were directed to stay clear of the load.

NFS has reported numerous hoisting and rigging events in several Weekly Summaries. Some examples follow.

- Weekly Summary 99-05 reported that a load chain for an air-operated hoist at the Pantex Plant fell from its retaining bucket, missing the hoist operator. The load chain failed to fall into the retaining bucket as it was designed to do. When a number of links from the load chain were outside the bucket, gravity pulled the remaining length of chain from the bucket, causing it to fall to within 3 ft of the bay floor. The operator was retracting the hook to its stored (up) position at the time the chain fell. He was unaware of the falling chain until a coworker heard the sound of the chain and alerted him to move out of the way. (ORPS Report ALO-AO-MHSM-PANTEX-1999-0004)

- Weekly Summary 98-01 reported two hoisting and rigging events at the Hanford Site. In the first event, facility operations personnel were lowering a 55-gal drum containing radiological waste when the drum slipped free of its rigging and fell approximately 8 ft. Investigators determined that the free end of the hoist chain caught on the drum lid closure ring bolt, relieving the load on one of the barrel hooks and causing the drum to slip free and fall. In the second event, riggers were lowering a drum onto a trailer when it slipped free and fell over, causing a rigger working on the trailer bed to fall and sustain a head injury. Investigators determined that when riggers lowered the drum, it caught on an adjacent drum on the truck bed and momentarily relieved the load on one of the barrel hooks of the lifting sling, causing the hook to disengage from the drum lid closure ring. (ORPS Reports RL--PNNL-PNNLBOPEM-1997-0002, RL--PHMC-FSS-1997-0030)

These events illustrate the importance of ensuring that all aspects of a lift are evaluated for potential hazards and that any actions to mitigate identified hazards are implemented. Dropped loads can be extremely dangerous. The Idaho event also underscores the importance of selecting an unobstructed vantage point when a task requires direct observation of equipment.

- DOE-STD-1090-96, rev. 1, *Hoisting and Rigging*, provides guidance for hoisting and rigging and identifies related codes, standards, and regulations. Chapter 2, "Critical Lifts," states that a lift shall be designated as critical if dropping the load could result in (1) an unacceptable risk of personnel injury or a significant adverse health impact, (2) significant release of radioactive or other hazardous materials, (3) undetectable damage that would jeopardize future operations or facility safety, or (4) damage that would cause an unacceptable delay in the schedule or have another significant impact on the program. Chapter 3, "Operation Evaluation," states that personnel must determine the consequences of a collision, upset, or dropping of the load.

KEYWORDS: hoisting and rigging, dropped load, rigging

FUNCTIONAL AREAS: Hoisting and Rigging, Industrial Safety

2. INADEQUATE WASTE CHARACTERIZATION LEADS TO PERSONNEL AND FACILITY CONTAMINATION

On March 21, 1999, at the Idaho National Engineering Environmental Laboratory Waste Experimental Reduction Facility, an operator preparing to size-reduce waste material was radiologically contaminated with europium. The low-level-waste sizing room was also contaminated. Radiological personnel decontaminated the operator and confirmed that contamination had not spread outside the sizing room. Europium is a rare earth metal that has a powder-like consistency, can easily become airborne, and is difficult to control. The facility manager ordered facility personnel to post the room to prevent entry until the amount of contamination in the room was characterized. Radiological personnel performed surveys and determined that localized contamination was present in the room near the area where the operator was working. Personnel inside the room during the activity were wearing respirators. Facility personnel had developed the radiological work permit and a work plan to size-reduce the waste using isotopic data from the site waste-tracking database, but the information was inaccurate. Inadequate characterization of the material resulted in contamination levels much higher than the levels specified in the radiation work permit. (ORPS Report ID--LITC-WERF-1999-0003)

Investigators determined that the waste material was contained in a wooden box labeled “metal and wood to be sized” and that the box had been moved from the Test Reactor Area to the Waste Experimental Reduction Facility in June 1997. Because the box showed signs of deterioration, they believe that it may have been stored at the Test Reactor Area for several years before being moved. Investigators determined that the operator had opened the waste box, noticed it contained an aluminum remote manipulator arm from the Test Reactor Area, and moved it into the sizing room to be cut with a plasma arc torch for volume reduction. The operator then performed a precautionary swipe survey to confirm that the manipulator contamination levels remained within the radiation work permit that he was using. However, a radiological technician in the area counted the swipe survey and determined that contamination levels were greater than 1 million dpm beta-gamma and 17,500 dpm alpha, exceeding the radiation work permit levels by approximately three orders of magnitude. The operator and the technician immediately covered and sealed the manipulator and left the room.

Investigators are considering adding procedural hold points to require the performance of several intermediate swipe surveys when personnel open waste boxes, especially when the contents are unknown. The facility manager will continue to review this event and develop corrective actions as needed.

NFS has reported inadequate characterization of material in several Weekly Summaries. Some examples follow.

- Weekly Summary 98-11 reported that the DOE Office of Enforcement and Investigation issued a Preliminary Notice of Violation under the Price-Anderson Amendments Act to Lawrence Livermore National Laboratory for inadequate waste characterization and conduct of operations issues. The Preliminary Notice of Violation was for multiple

failures to implement radiological protection requirements and provide the quality controls necessary to protect workers involved in high-efficiency particulate air (HEPA) filter shredding operations. Investigators determined that although waste characterization data were available for the shredded HEPA filter, the data on the HEPA-filter waste storage box label and on the radioactive waste disposal requisition form were incorrect. They also determined that no one had confirmed the label's accuracy or performed radiological surveys or additional characterization of the HEPA filter before it was shredded. (NTS Report NTS-SAN--LLNL-LLNL-1997-0001; ORPS Report SAN--LLNL-LLNL-1997-0038; DOE/OAK-540, Rev. 0, "Type B Accident Investigation Board Report of the July 2, 1997, Curium Intake by Shredder Operator at Building 513 Lawrence Livermore National Laboratory, Livermore, California,")

- Weekly Summaries 97-48 and 98-39 reported on an event in which six workers performing maintenance on a remote-handling manipulator at the Idaho National Engineering Environmental Laboratory Hot Cell Facility were contaminated with europium. Approximately 10,000 sq ft of the facility were also contaminated. Investigators determined that the radiological control technician had allowed workers to remove the manipulator sleeve without characterizing its radiological contents. They formed an investigation team that reviewed this and seven additional similar events that have occurred at the Hot Cell Facility since August 1996. The team determined that inadequate procedures, lack of procedural compliance, and the need for more training and better awareness of the characteristics of europium and gadolinium were common causes for these events. Team members believe that the large number of similar occurrences indicates that facility personnel are correcting individual procedures without identifying and correcting the overall problem. Weekly Summary 98-26 reported that the DOE Office of Enforcement and Investigation issued two Preliminary Notices of Violation under the Price-Anderson Amendments Act for this event. The staff identified multiple procedure violations, ALARA violations, and radiological control violations. (NTS-ID--LITC-TRA-1997-0003; ORPS Report ID--LITC-TRA-1997-0021; Letter, DOE (P. Brush) to Lockheed Martin Idaho Technologies Company (W. Denson), 6/4/98; and Letter, DOE (P. Brush) to MAC Isotopes, L.L.C (S. Laflin), 6/4/98)

These events underscore the importance of properly characterizing waste and clearly communicating this information to workers to ensure that radioactive wastes are processed, handled, labeled, and stored in the prescribed manner to prevent a release of radiation or personnel exposure. Waste material processing, packaging, and handling requirements should be well defined to eliminate confusion or the need for interpretation. Each person who packages, stores, or ships waste materials should have the same understanding of the waste material requirements. Personnel should be able to properly identify and understand the risks involved when working with hazardous waste. Workers in facilities that contain hazardous waste should be trained in the proper methods for handling, labeling, and storing waste. Facility procedures should provide work plans for waste movement and characterization and should require their use.

Facility managers should emphasize the importance of following existing policies and procedures for any evolution involving an unknown material. Facility personnel in charge of work instruction preparation and managers who approve work instructions should review the following documents and ensure that work packages provide specific instructions for the work scope and address all potential radiological conditions.

- DOE O 5480.23, *Nuclear Safety Analysis Reports*, requires performing a hazard analysis to ensure comprehensive, integrated, and balanced risk management of all safety and environmental hazards. Section 3 requires analyses of expected releases, exposures, and accidents. It also requires consideration of residual risks to ensure that the risks and consequences of operation are acceptable and conform to safety design objectives.

- DOE/EH-0256T, *U.S. Department of Energy Radiological Control Manual*, provides clear direction on the marking, monitoring, and control of radioactive materials. Chapter 3, "Conduct of Radiological Work," provides requirements for the conduct of work to ensure safety and maintain radiation exposures as low as reasonably achievable. This chapter details requirements for work planning, radiological work permits, protective clothing, work conduct and practices, communications, and radiological stop-work authority. Chapter 4, "Radioactive Materials," provides direction on radioactive material identification, storage, and control.

KEYWORDS: characterization, waste handling

FUNCTIONAL AREAS: Radiation Protection, Materials Handling/Storage

3. CONDUCT OF OPERATIONS LEADS TO PROCESS STAND-DOWN

On March 29, 1999, the Savannah River Fuel Management Division Vice President stood down operations following a series of events related to the conduct of facility operations. Individually, none of the events would have warranted a stand-down; however, they are collectively significant indications of the need for attention to detail. The events included lapses in conduct of operations related to procedure compliance, log-keeping, communications, equipment tagging, alarm response, and shift turnover.

In the first event, on March 18, 1999, a DOE facility representative who was reviewing the records for sump operations discovered that part of a procedure had not been completed. One step in the procedure, which had been performed on February 8, 1999, required the user to conduct a subtask in accordance with an appendix to the procedure. An operator had signed off the step as complete but had not filled in the appendix, which contains a step requiring a second operator to verify that a sump pump has been turned off when the sump is empty. During a subsequent review of the procedure, an operations manager certified that all required steps had been completed but he did not notice the appendix had not been completed. Facility supervisors immediately verified from operator round sheets that the pump had been turned off. (ORPS Report SR--WSRC-REACK-1999-0010)

Investigators determined that operating personnel use the procedure to discharge the sumps at intervals of approximately 45 days. They also determined that the operating crews routinely conduct briefings for infrequent or unusual tasks but may not conduct detailed briefings for routine tasks. For example, they did not conduct a pre-job briefing for this task. The operator who carried out the procedure says he had not read the part of the step that referred him to the appendix. He also says he had a heavy workload that day, although his supervisor had not been exerting any pressure on him. The operations manager says he doesn't recall details of his review but does remember that the operator had completed all steps in the body of the procedure.

In the second event, on March 20, 1999, an operator reported that steam flow to an auxiliary evaporator he had just placed in service was fluctuating. An operations manager directed him to shut the unit down and asked electrical and instrumentation (E&I) personnel to troubleshoot the steam control valve. After E&I personnel determined that the valve was working properly, the operations manager instructed operators to check the evaporator system valve lineup. They discovered a valve that was closed although it should have been opened during a pre-startup valve alignment procedure. At a critique of the event, the operator said that he had confused two steps in the procedure. (ORPS Report SR--WSRC-REACK-1999-0011)

In the third event, between March 18 and March 21, 1999, operators failed to notice that a tritium monitor required to be operable during bundling activities had been tagged out of service. As a

result, they conducted bundling operations for control rods, sparger inserts, and targets for approximately 3 days without adequate monitoring for a potential release of tritium. (ORPS Report SR--WSRC-REACK-1999-0012)

Investigators determined that on March 18, 1999, a different operating shift had observed that the recorder and alarm for a tritium monitor did not respond correctly to a functional check. They placed a tag on the instrument but did not take it out of service, nor did they transmit the information to other operating personnel. The operators who were bundling the components tested the instrument for operability by checking for suction flow at the sample line intake. However, because they did not check the instrument itself, they did not know that it had malfunctioned.

In a fourth event, an operator was steam-washing drums under a hood to remove traces of tritiated heavy water when a tritium alarm sounded. He stopped work, moved to a safe location, and notified the shift supervisor. The shift supervisor and a health physics technician investigated the alarm, noticed an upward trend in tritium monitor readings, and concluded that the steam the operator was using was affecting the instrument. The shift supervisor advised the operator that he could return to work. On the following day, they learned that the exhaust fan for the hood had been inoperable during the entire process.

Investigators determined that personnel on an earlier shift had removed the hood exhaust fan drive belt for corrective maintenance. They had not tagged out the motor nor had they placed a caution tag on the hood. They neither informed the on-coming shift of the status of the hood exhaust system nor recorded their actions in shift operating or equipment status logs. The operator who used the hood had started the exhaust fan motor but did not notice that the fan itself was not operating.

These four events at Savannah River underscore the need to maintain formality and to give attention to detail in the conduct of shift operations. Their immediate effects were limited to process interruptions or delays. However, valve misalignments, procedure violations, the loss of equipment status, and communications failures have the potential for far more serious consequences. One example, reported in Weekly Summary 98-36, involves a pump failure at Oak Ridge. The casing on a large, single-stage centrifugal pump failed explosively, projecting debris throughout an operating area and causing extensive damage to nearby equipment and structures. Facility personnel had operated the pump for more than two hours with its manual inlet and outlet valves closed. An operator received superficial cuts on the face and upper chest when pump debris struck and shattered a heavy glass window in an enclosed control area. Investigators cited several lapses in conduct of operations as major contributors to the event. (ORPS Report ORO--LMES-Y12SITE-1998-0039 and OEWS 98-36)

DOE O 5480.19, *Conduct of Operations Requirements for DOE Facilities,* chapter I, “Operations Organization and Administration,” states that a high level of performance is achieved in DOE operations by establishing high operating standards, by ensuring that personnel are well trained, and by holding workers and their supervisors accountable for their performance in conducting activities. The Order also states that it is the responsibility of the shift operating crew to operate the facility safely by adhering to operating procedures and operational safety requirements and by using sound operating practices. Facility managers who oversee shift operations should review their policies and procedures to ensure that appropriate conduct of operations requirements and recommendations are incorporated, giving particular attention to the following chapters of DOE O 5480.19.

- Chapter II, “Shift Routines and Operating Practices,” describes professional watch-standing practices for all operating personnel. Section 6, “Response to Indications,” states that operators should treat instrument readings as valid unless

they can prove otherwise. When operators are in doubt, safety should always be placed above production.

- Chapter VIII, "Control of Equipment and System Status," describes methods of ensuring that facility equipment and systems are maintained in accordance with the design basis authorization and that facility personnel are aware of their status.

- Chapter XI, "Logkeeping," provides guidelines for establishing operating logs, recording information, ensuring legibility of entries, and performing reviews of logs. Logs are a valuable tool for transferring information among operating personnel.

- Chapter XII, "Operations Turnover," states that shift turnover is a critical part of DOE facility operations. The Order also states that on-coming personnel should not assume operational duties until both they and the off-going personnel have a high degree of confidence that an appropriate information transfer has taken place. On-coming personnel should conduct a comprehensive review of appropriate written information (logs, records) and visual information (equipment, controls, status boards) before responsibility for the shift is transferred. A checklist should guide shift turnovers, and turnovers should include a facility walk-down and a thorough review of documents describing facility status.

- Chapter XVI, "Operations Procedures," states that operations procedures should provide direction to ensure that the facility is operated safely and within its design basis. Developers should give attention to writing, reviewing, and monitoring operations procedures to ensure that the content is technically correct and the wording and format are clear. Facility operators should develop procedures for all anticipated operations or evolutions.

KEYWORDS: communication, conduct of operations, equipment status, procedure

FUNCTIONAL AREAS: Conduct of Operations

4. ELECTRICAL MODIFICATION OF DAMAGED TOGGLE SWITCH RESULTS IN POTENTIAL SHOCK HAZARD

On March 17, 1999, at Sandia National Laboratory—Albuquerque, equipment operators identified a potential electrical shock hazard when they found a damaged toggle switch while preparing an oven for operation. Uncertain about the safety and operability of the switch, they immediately contacted the equipment maintenance team leader. The team leader used a voltmeter to determine that the switch body was electrically energized. The painted surfaces of the oven cabinet had apparently prevented the switch from shorting to ground. Technicians unplugged the oven, removed the damaged switch, and returned the oven to service. A previous user of the oven had rewired the switch after the switch was damaged. Although no personnel injury occurred, the damaged switch and the electrical modification constituted a potential shock hazard. (ORPS Report ALO-KO-SNL-14000-1999-0001)

Investigators determined that the oven was an old commercial unit that had been used years ago at the Pinellas Plant. While at Pinellas, the toggle switch that controls the oven light became

damaged. Personnel decided to rewire the oven so that the light would always be on. The modification left the toggle switch energized. Personnel later shipped the oven from Pinellas to Sandia, where it sat unused for 3 years. When Sandia personnel put the oven into service to perform aging tests on neutron tubes, the equipment operators discovered the potential shock hazard.

OEAF engineers reported a similar event in Weekly Summary 98-25. In that event, a technician at the Los Alamos National Laboratory Materials Science Complex received a mild shock while cleaning dust from the outside surface of a resistance furnace oven. The technician completed a 110-V circuit when one of his hands contacted the oven chassis while the other was on another grounded device. An inspector determined that someone had modified the main power cord ground wire, creating an electrical hazard. Personnel who acquired the oven were unaware that it had been modified. The previous owners of the oven did not document the modification or label the oven to indicate that it had been modified. (ORPS Report ALO-LA-LANL-MATSCCMPLX-1998-0002)

These events illustrate the importance of documenting equipment repairs and modifications. Apparently the modification at Pinellas was not adequately tested or checked to ensure that it was electrically safe and no information on the modification was transferred with the oven to Sandia. Also, Sandia personnel did not perform a safety inspection of the oven or check out its operation before placing it into service. Electrical equipment modifications should be approved and in compliance with electrical codes and standards. The control of equipment status and modification is important to personnel safety.

- DOE O 5480.19, *Conduct of Operations Requirements for DOE Facilities*, chapter VIII, "Control of Equipment and System Status," states that DOE facilities are required to establish administrative control programs to handle configuration changes arising from maintenance, modifications, and testing.

- DOE-STD-1073-93-Pt.1 and -Pt.2, *Guide for Operational Configuration Management Programs, Including the Adjunct Programs of Design Reconstitution and Material Condition and Aging Management*, provides guidelines and good practices for an operational configuration management program, including change control and document control.

KEYWORDS: electrical hazard, oven, modification, shock hazard, switch

FUNCTIONAL AREAS: Configuration Control, Industrial Safety, Modifications

5. DEFICIENCIES IN SUBCONTRACTOR-SUPPLIED SERVICES AND EQUIPMENT

OEAF engineers reviewed recent events involving deficiencies in electrical distribution and wiring systems work supplied by subcontractors. Although the sample events involve electrical deficiencies, adverse subcontractor safety trends have been identified across the complex. The events are significant because the consequences of substandard contracted work significantly compromised employee safety and had the potential for personnel injury. (ORPS Reports OH-AB-RMI-RMIDP-1999-0001, SR--WSRC-HWFAC-1999-0002, ORO--MK-WSSRAP-1999-0005)

- On March 18, 1999, at the Ashtabula RMI Decommissioning Project, a contractor received an electrical shock while testing a programmable logic controller on an energized 24-V dc circuit. In accordance with DOE guidelines for working on low-voltage circuits, the system testing procedure did not require the use of protective gloves. The contractor had verified the voltage on the circuit and had also

confirmed that cable shields and ground wires were connected as required. Investigators determined that, contrary to supplied wiring diagrams, a separate installation contractor had miswired power and control circuits, which applied 120 V ac to the shield of the 24-V dc control cable.

- On March 4, 1999, electrical and instrumentation personnel at the Savannah River Heavy Water Facility discovered 240 V ac on a circuit they had locked out in preparation for supplying power to a portable building. Power was to be taken from a vendor-supplied power supply consisting of a 480-V to 240-V transformer. They had locked out a breaker supplying several disconnect switches in accordance with the vendor's drawings. A physical examination of the wiring by engineers revealed that some of the disconnect switches were wired to the supply side of a 240-V ac breaker instead of the load side. It also revealed that the vendor had miswired a 240-V ac outlet with a hot wire on the neutral terminal.

- On February 15, 1999, at the Weldon Spring Site, subcontractor electricians were connecting power from a transformer to a new trailer when a laborer inside the trailer observed smoke coming from an overhead lighting fixture. The electricians were notified and power was immediately disconnected. During the electrical hookup, wires were incorrectly connected to the transformer, which resulted in 220 V being applied to the 110-V circuits in the trailer. Investigators determined that the electricians had failed to perform a continuity polarity test and a voltage test before and after making the connection to the transformer.

Recent changes in the DOE mission have led to the widespread decommissioning or upgrade of existing facilities and the construction of new facilities. These activities, in turn, have led to sharp increases in the use of subcontracted services and equipment, along with proportional increases in the number of industrial safety and quality of work-related events involving subcontractors. Deficiencies in subcontracted services are also evident in routine daily operations, where tasks should be well defined.

Subcontracts are usually awarded to the lowest cost technically qualified bidder. It may, therefore, be in a subcontractor's best interest to meet minimum contract obligations at the lowest possible cost, which can lead to poorer quality workmanship, rushed job performance, or neglected performance requirements. Some ways by which prime contractors can contribute to the success of subcontracted services follow.

- Develop bid specifications that clearly spell out the roles and responsibilities of subcontractors. An adequately detailed bid specification allows potential subcontractors to submit realistic and achievable bids and establishes measurable safety and quality standards for both the contractor and the subcontractor.

- Ensure that contracts contain penalties for poor subcontractor performance in the areas of safety and quality, and apply them if performance warrants. Some examples of penalties are citations, work stand-downs, withholding or reducing payment, and dismissal.

- Integrate subcontractor personnel into key facility or site administrative and safety training programs. Ensure that subcontractors have been adequately informed of site- and job-specific safety requirements and practices.

- Develop and implement acceptance tests for deliverables that are consistent with their safety and hazard significance, complexity, and cost.

- Avoid overreliance on skill-of-craft methods to meet safety and quality-of-work requirements.

- Renew emphasis on internal oversight and control of subcontractor activities while work is in progress. This would ensure that subcontractors are complying with contract requirements and are not experiencing serious difficulties with work scope and schedules. Direct contact should include frequent visits to the work site and regular participation in planning meetings and pre-job briefings. Ensure that oversight and review activities reflect the significance of the work and the hazards associated with it.

These events underscore the importance of positive control of subcontractors and vendors. They point to a need for aggressively transmitting requirements and procedures to subcontractor organizations, comprehensively involving subcontractors in the work planning process, and rigorously monitoring subcontractor performance to deter human error and noncompliance with procedures.

The Office of Oversight Analysis analyzed the issue of subcontractor supervision and safety in a September 1998 report. The report recommends additional emphasis on (1) analyzing the trends in subcontractor safety near misses and using transient subcontractors who move from site to site to perform specific tasks as opposed to “one-time” subcontractors, (2) monitoring line management’s approach to the oversight of subcontractors, and (3) reviewing prequalification activities to ensure that expectations are understood before the bid is awarded. The report can be found at http://tis.eh.doe.gov/oversight/analysis/ subcontsafe.pdf.

KEYWORDS: contractor controls, electrical safety, subcontractor

FUNCTIONAL AREAS: Construction, Management

6. CONSTRUCTION CONTRACTOR VIOLATES CONTROLLED AREA POSTINGS

On March 18, 1999, at Argonne National Laboratory—East (ANLE), a superintendent for a subcontractor construction company entered a controlled area, violating the posting requirements. The signage stipulated that a film badge was required and that food and drink were not allowed. The superintendent did not have a film badge, and he was carrying a cup of coffee. He also ducked underneath a yellow "DO NOT ENTER" tape barrier that had a sign advising that there was no entry without authorization. Facility personnel had installed the barrier after pieces of concrete fell from the ceiling. A health physics technician saw the superintendent in the taped-off area and asked him to leave. Violation of area postings can result in radiation exposures, spread of contamination, and personnel injury. (ORPS Report CH-AA-ANLE-ANLEPFS-1999-0001)

The superintendent’s company had been contacted by the Facilities Engineering and Construction department to submit a price quote for repairing a damaged pillar. On March 16, fragments of concrete fell from the pillar and landed within 10 ft of some workers (ORPS Report CH-AA-ANLE-ANLEER-1999-0002). The superintendent was unaccompanied because he was visiting the building where the damage had occurred before meeting with ANLE personnel. He signed in to the building to review the area within a controlled area where concrete had fallen. He entered

the taped-off area to get to a stairway leading to the upper five levels of the high bay when the health physics technician asked him whether he had authorization. He then left the area and the room, checked himself on the hand and shoe monitor, and signed out of the building.

An investigation was conducted by the building manager, construction safety personnel, and facilities engineering personnel. As a result, the superintendent was issued a Notice of Safety Violation, was suspended from the ANLE site for three days, and had his company status as an Environment, Safety and Health representative revoked. He will be retrained in construction safety orientation and general employee radiation training. Retraining in the radiation worker I course will be done at his company's option, but he will not be allowed to work in controlled areas until he completes the course.

NFS has reported many entry requirement and posting violation events in the Weekly Summary. Some examples follow.

- Weekly Summary 97-21 reported that a vendor at the Savannah River Site did not have the required thermoluminescent dosimeter (TLD) and had driven through a radiological work permit/dosimetry-required area without an escort. Investigators determined that he had not signed the standing radiological work permit or viewed the video for facility access training. Also, he entered the facility without reading the signs at the entrance to the TLD/dosimetry-required area. (ORPS Report SR--WSRC-ITP-1997-0016)

- Weekly Summary 96-15 reported two events at Brookhaven National Laboratory involving the entry of personnel into controlled areas without proper authorization. On March 23, 1996, a shift supervisor found two contractors inspecting refrigeration machines in a radiation area. When questioned, the inspectors said they had not completed the required radiation worker training and had not been issued the required dosimeters. On April 3, 1996, a contractor entered a filter room, moved a radiation barrier, and entered a radiologically controlled area before post-cleanup contamination survey results had been received. (ORPS Reports CH-BH-BNL-PE-1996-0005 & -1996-0007)

These events illustrate the importance of understanding and following posted radiological entry requirements. Facility managers must ensure that subcontractors and visitors understand and abide by entry requirements for controlled areas. DOE EH-0256T, *Radiological Control Manual,* contains guidance on training, access restrictions, and escort requirements for visitors at DOE facilities.

KEYWORDS: entry requirement, personal dosimetry, postings, radiological monitoring, training

FUNCTIONAL AREAS: Radiation Protection

FINAL REPORT

This section of the OEWS discusses events filed as final reports in the ORPS. These events contain new or additional lessons learned that may be of interest to personnel within the DOE complex.

1. GUEST RESEARCHER OPERATES LASER WITHOUT AN APPROVED SAFETY PROCEDURE

On February 2, 1998, at the Lawrence Livermore National Laboratory, an Environment, Safety and Health technician performing routine laser interlock inspections discovered a guest researcher operating an open beam, Class II laser without authorization. The technician stopped the operation and notified the appropriate facility managers. Investigators determined that the guest had operated the laser with the interlocks bypassed and without an approved project work plan. He had also operated a Class IIIB, cadmium/helium laser with the interlocks bypassed and without an approved project work plan. Lasers pose a hazard to the retina, cornea, and lens of the eye. Failure to follow procedures and bypassing interlocks can result in personnel injury or damage to equipment. (ORPS Report SAN--LLNL-LLNL-1998-0007)

An incident analysis committee concluded that the guest researcher did not have a clearly defined purpose when he arrived at the Laboratory in October 1997. Moreover, he was also conducting simultaneous research at Lawrence Berkeley Laboratory, the University of California at Davis, and the Naval Research Laboratory, making it difficult for the host/principal investigator to keep track of his daily activities and to meet with him regularly. The guest had a key to the lab, and he had little or no interaction with his host/principal investigator, the room-responsible person (RRP), or other building personnel.

Committee members determined that the direct cause of the incident was that the guest blocked the laser safety shutter open while operating the laser. He was unaware that bypassing laser interlocks violated Laboratory safety and health policies and procedures, because when he arrived he received only a limited briefing on them. The committee members identified the following contributing factors.

- **Personnel Error** — The guest assumed that because health and safety policies and procedures were not rigidly enforced at other institutions where he had worked, they were not rigidly enforced at the Laboratory.

- **Training** — Training provided by the Laboratory was not sufficient to influence the guest's behavior or to alert him to the appropriate safety controls for the operation of the Class IIIB laser. Also, there was no formal way to identify or track the health and safety training offered. In addition, it is unclear whether the training needs of the guest had been thoroughly evaluated and whether the training provided was adequate.

- **Management Problem** — Work planning was deficient in that the guest researcher did not have a clearly defined project. Also, he was not told who the RRP was, nor was the RRP informed of the guest's experimental activities. In addition, the guest was given a key to the room without RRP approval. As a result, neither the supervisor nor the RRP monitored the guest's activities. Another problem was management's failure to have the guest's activities reviewed by the environment, safety, and health team. Such a review would have identified the need for an operational safety procedure for bypassing the interlocks. In addition, the guidance in the health and safety manual does not specifically require an operational safety procedure when work is performed by a visitor/guest with a Class III laser, which is inconsistent with other safety procedures.

Committee members concluded that the root cause of this incident was that because a guest was involved, Chemistry and Materials Science Facility managers did not fully implement the Facility’s environment, safety, and health management system.

- Managers did not ensure that (1) environment, safety, and health controls were identified and implemented, (2) the guest's activities were well defined, and (3) his activities were sufficiently supervised (Integrated Safety Management, Principle 1).

- Expectations that guests would follow environment, safety, and health policies and procedures were not effectively communicated (Integrated Safety Management, Principle 2).

Guests and visitors present special challenges to the management of environment, safety, and health. While many guests are experts in their field, they may not be familiar with the Laboratory's specific work requirements. They are, moreover, often unfamiliar with the Laboratory's commitments to risk management. These commitments include specific controls and knowledge of the Laboratory's integrated safety management process. As a result, such people need even more supervision than regular Laboratory employees, who are familiar with Laboratory expectations for safety. Some hosts assume that guests do not require much in the way of supervision because of their skills, knowledge, and abilities. This is an erroneous assumption, particularly if hosts are not familiar with the environment, safety, and health requirements and expectations at their guests' home bases, or if they are unfamiliar with their attitude to environment, safety, and health or their past safety performance.

This incident has made Chemistry and Materials Science Facility managers and Laboratory managers aware that they need to manage guests and visitors more rigorously. Some of their corrective actions follow.

- Facility managers need to ensure that guests and visitors are given sufficient supervision. Managers must also ensure that the RRPs are notified before work is allowed to begin in their area(s) and that guests and visitors know who the RRP is for the area where they are working.

- Facility managers need to ensure that guest and visitor activities are well defined before their work is authorized. Managers need to ensure that guest and visitor activities are monitored for compliance with safety requirements.

- Facility managers need to ensure that expectations that environment, safety, and health policies and procedures will be followed are effectively communicated.

- Facility managers need to develop a policy for controlling keys.

- Hosts/principal investigators need to consult with their area environment, safety, and health team when new or modified experiments are undertaken. They need to prepare the appropriate operational safety procedure for the experiment.

- The Materials Science and Technology Division host/principal investigator needs to reevaluate the training needs for guests to ensure that the training offered is appropriate for their activities and work area(s). He also needs to ensure that all health and safety courses have been taken before guest activities are authorized.

- Management needs to ensure not only that a copy of the Chemistry and Materials Science Facility Visitor safety pamphlet is given to all guests and visitors but also that it is reviewed with them.

- The Deputy Director's Office will request associate directors to take appropriate steps to ensure that environment, safety, and health requirements, policies, and procedures are effectively communicated to guests and visitors. The Environment, Safety and Health Working Group will continue to consider additional mechanisms to help ensure the safety of Laboratory guests and visitors.

- The Laboratory needs to develop a formal procedure for identifying and tracking the training needed by guests and visitors.

Chemistry and Materials Science Facility managers learned that it is important to provide adequate supervision and oversight when guests and visitors first arrive and as their activities progress. In this event, they had wrongly assumed that the guest's experience as a laser researcher and his work in a similar research laboratory made him familiar with the appropriate environment, safety, and health controls.

KEYWORDS: industrial safety, laser, training and qualifications

FUNCTIONAL AREAS: Industrial Safety, Research and Development, Training and Qualification